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Original Article

Evaluation of neurosensory disturbances of the inferior alveolar nerve after intraoral verticosagittal ramus osteotomy

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ABSTRACT

Purpose: To assess the incidence of neurosensory disturbances (NSD) of the inferior alveolar nerve (IAN) after Intraoral verticosagittal ramus osteotomy (IVSRO).
Materials and methods: The sensibility of the chin and lower lip of ten consecutive patients undergoing IVSRO was assessed. Evaluations were performed at 7 days preoperatively, 7 days, one month and six months postoperatively. The chin was divided into four quadrants, which were tested separately. The tests used were: two-point discrimination (2-P), brush stroke direction discrimination (BSD) and thermal stimuli (TH). Postoperatively, patients also answered a questionnaire.
Results: The values for 2-P showed statistically significant difference when compared to preoperative measurements ($P > 0.05$) in all quadrants, with exception to quadrant D. There was no statistically significant difference among preoperative values and 7 days, 1 month and 6 months postoperative values. For BSD and TH tests, no differences were found among time points. None of the 10 patients reported complete numbness after 1 week. After 6 months, complete recovery of the chin sensibility was reported in all 10 cases.
Conclusion: This study showed, objectively and subjectively, a low incidence of NSD after IVSRO. Further studies with larger samples are necessary to confirm these results.

1. Introduction

The bilateral sagittal split osteotomy (BSSO) is a very versatile technique that allows all kinds of movements, being the most commonly used technique in the treatment of mandibular deformities. Its greatest drawback is the risk of paresthesia of the inferior alveolar nerve (IAN), which can vary from 0% to 100%, according to several authors [1,2].

Numbness of the inferior lip and chin can bring great discomfort to patients, making it difficult to eat, drink or even talk. To minimize this risk, adaptations were made to the original BSSO technique and new techniques were created.

In 1992, Choung described the intraoral verticosagittal ramus osteotomy (IVSRO) [3]. According to the author, the technique could be used for treating condylar hyperplasia, high condylar fractures and dentofacial deformities, especially those associated with temporomandibular joint (TMJ) symptoms; basically, the same indications of the intraoral vertical ramus osteotomy (IVRO). Nonetheless, given the greater bony contact between the distal and proximal fragments, this technique can be used for other kinds of movement as well, such as minor advancements and rotations, supposedly with a lesser risk to the IAN than BSSO.

A few studies have investigated this assumption [4,5]. However, they relied solely on subjective assessment methods. The aim of the present paper is to evaluate the incidence of Neurosensory Disturbances (NSD) of the IAN after the IVSRO, using subjective and objective assessment methods.

2. Materials and methods

This study was conducted in an interventional fashion, with no control group. The sample consisted of 8 women and 2 men, with ages varying from 19 to 44 years, with a mean of 27.5 years. Each patient was evaluated bilaterally, comprising 20 IANs.

The inclusion criteria were complete preoperative and post-operative documentation and postoperative follow-up of, at least,

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6 months, whereas exclusion criteria were previous mandibular fractures, infection or IAN disturbances.

All subjects underwent three tests of neurosensory function: two-point discrimination (2-P), brush stroke direction discrimination (BSD) and thermal stimuli (TH). 2-P and TH tests were performed according to Ylikontiola et al. [6], whereas BSD was performed according to Milloro & Repasky [7]. Tests were always performed in the same order and by the same investigator, who was blinded to the treatment performed. The chin was divided into four quadrants, which were analyzed separately (Fig. 1). Evaluations were performed at 7 days before surgery, 7 days, one month, three months and six months after surgery.

All surgeries were performed by the same surgeon, under general anesthesia. The IVSRO was performed according to Fujimura et al. [8] Intermaxillary fixation was applied with wires before suturing and was kept for 21 days postoperatively. Rigid fixation was not performed on any patient.

At the follow-up consultations, a subjective evaluation was also performed (Appendix A).

The data were analyzed with the statistical package SPSS, version 15.0 for Windows. At first, the residual distribution and the randomness of the data were tested. After that, ANOVA and the Bonferroni's Test were conducted to adjust multiple comparisons, aiming to observe the variance of sensibility (2-P) through time, in accordance with the facial quadrant (A, B, C or D). To observe the behavior of the tests BSD and TH and subjective sensibility of the individual, a distribution of absolute frequency was used. To compare the level of subjective sensibility of the patients through time, the Friedman's Test was used.

3. Results

For the 2-P test, the mean values presented preoperatively in the quadrants A, B and C were inferior to those obtained seven days after surgery ($P < 0.05$). As for the quadrant D, the values did not differ statistically over time. The measures obtained one and 6 months after surgery did not differ statistically from the preoperative measures in all quadrants (Table 1).

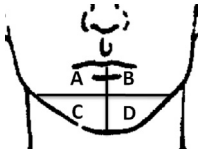

Fig. 1. The chin region divided into 4 quadrants. A vertical line across the midline of the face divided the chin in right and left sides and a horizontal line across the mentolabial fold divided the chin in lower lip area and chin area.

When the 2-P values for the right and left sides of the mandible were compared, it was observed that, on the right side, the preoperative mean value was statistically different from the one seven days after surgery, but not from the ones one month and six months after surgery. The mean value after seven days also differed from the value presented six months after surgery ($P < 0.05$). On the left side, there was also a statistically significant difference between the preoperative value and the one seven days after surgery, but it was not observed a statistically significant difference among the seven days, one month and six months values (Table 2).

When the 2-P values were compared between the lower lip and chin areas, at the former, the preoperative mean value differed statistically from the one seven days after surgery ($P < 0.05$), but not from the ones one and six months after surgery. At the chin area, a statistically significant difference was not observed between the mean values and the periods of time studied (Table 3).

On both BSD and TH tests, all ten patients had normal responses throughout analyses.

As for the subjective numbness, it was observed an increase in the number of patients who reported lower levels of numbness over time ($P = 0.001$). Seven days after surgery, three patients referred no alteration of sensibility, three, normal to mild numbness, three, mild to moderate and, one, moderate. One month after surgery, three patients referred no alteration, six, normal to mild and one, mild. After six months, all patients reported normal sensibility of the region. No patient reported complete numbness of the lower lip, after surgery (Fig. 2).

When asked about any kind of weird feeling on the lower lip, eight patients had no complaints over all the follow-up consultations. One reported tickling seven days after surgery and two reported tickling one month and six months after surgery (Fig. 3).

Among the 10 patients, only two said they would not undergo the same procedure again and would not recommend this kind of surgery to someone close. No patient changed his or her mind over time.

4. Discussion

Previous studies [4] report the low incidence and even the absence [5] of NSD of the IAN after IVSRO. Nevertheless, these studies lack objectivity, since they were solely based on questionnaires. To

Table 1
Comparison of mean values of sensibility (2-P, in mm) in each quadrant, over time.

Quadrants	Preoperative	7 days after surgery	1 month after surgery	6 months after surgery
	$\bar{x}$ (95% CI)	$\bar{x}$ (95% CI)	$\bar{x}$ (95% CI)	$\bar{x}$ (95% CI)
A	6.80 (5.37; 8.23)[a]	8.60 (7.07; 9.93)[b]	8.00 (6.57; 9.43)[a,b]	7.20 (5.77; 8.63)[a,b]
B	6.90 (5.28; 8.52)[a]	8.80 (7.18; 10.42)[b]	8.50 (6.88; 10.12)[a,b]	7.40 (5.78; 9.02)[a,b]
C	7.30 (5.60; 9.00)[a]	9.00 (7.30; 10.70)[b]	8.20 (6.50; 9.90)[a,b]	7.00 (5.30; 8.70)[a,b]
D	7.10 (5.67; 8.53)[a]	8.00 (6.57; 9.43)[a]	7.80 (6.37; 9.23)[a]	6.90 (5.47; 8.33)[a]

95% CI: confidence interval of 95%. Means identified with different letters are statistically different from one another (Bonferroni test, $P \leq 0.05$).

Table 2
Comparison of mean values of sensibility (2-P, in mm) on each side, over time.

Side	Preoperative	7 days after surgery	1 month after surgery	6 months after surgery
	$\bar{x}$ (95% CI)	$\bar{x}$ (95% CI)	$\bar{x}$ (95% CI)	$\bar{x}$ (95% CI)
Right	7.05 (5.58; 8.52)[a]	8.75 (7.28; 10.22)[b]	8.10 (6.63; 9.57)[a,b]	7.10 (5.63; 8.57)[a]

Right: quadrants A and C; left: quadrants B and D; 95% CI: confidence interval of 95%. Means identified with different letters are statistically different from one another (Bonferroni test, $P \leq 0.05$).

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